1880 they produced 18,800 tons, and their output is now at the rate of 52,000 tons per annum. The new works now in course of construction in this country and on the Continent, when completed, will at once increase the production of ammonia soda by 65,000 to 70,000 tons annually.

What then can the manufacturer of Leblanc soda expect save utter collapse? But the state of the alkali-maker threatens to become even worse than it is. The source of the sulphur which is used in the Leblanc process is pyrites; the pyrites employed in this country is almost exclusively imported by three large companies from Spain and Portugal; it contains from 2 to 3 per cent. of copper, and very small quantities of silver and gold. When the soda manufacturer has burnt off the sulphur, he sends the residual ore to the copper extractor, who is able to sell the iron oxide which remains when he has taken out the copper at about 12*s.* per ton. Now the French soda-manufacturers make use of pyrites of their own, which contains little or no copper; one of the large companies which supplies the English market purposes, therefore, to start works in France, which shall employ Spanish pyrites, but which shall depend for their profits, not on the soda which they manufacture, but on the copper and iron oxides remaining after the sulphur has been burnt off from the pyrites. This company, which starts with a capital of over a million sterling, speaks of building five large works in France, and one in the neighbourhood of Antwerp.

The Leblanc soda manufacturers have tried to persuade themselves that the price of ammonia must rise considerably, and that thus they may be able to compete with the ammonia soda-makers on more equal terms than at present. But in place of ammonia becoming dearer, its price is steadily falling. New sources of ammonia are being found; a process for collecting ammonia and other volatile products from coke-ovens, which is easily applied to existing ovens, has recently been patented by Mr. J. Jameson of Newcastle-on-Tyne. If this method should be generally applied to the coke-ovens in this country, a quantity of ammonia corresponding to 180,000 tons of ammonium sulphate, worth about three and a half millions sterling, would be annually saved.

Mr. Ferrie—a member of the great iron firm of William Baird and Co.—has also contrived a method whereby the ammonia and tarry matters which are present in the gases of the blast furnace may be condensed; this process has been at work for some time at Gartsherrie, and by its help about 20 lbs. of ammonium sulphate are obtained per ton of coal burnt in the blast furnaces.

Another difficulty which presses heavily on the manufacturer of soda by the Leblanc process consists in the want of an outlet for the great quantities of hydrochloric acid which accumulate during the soda manufacture.

This difficulty is not felt by the Continental manufacturer because he finds a ready market for the chlorine which can be extracted from hydrochloric acid; but in England the supply of chlorine at present much exceeds the demand. But Mr. Weldon holds out hopes to the English chlorine-maker; he says: "I think that our English manufacturers of Leblanc soda will have to cease to devote their hydrochloric acid—when they do not throw it away—exclusively to chlorine making; . . . the difficulty hitherto has been how to turn it to account otherwise. I believe that difficulty is about to disappear. I am not free to enter into that matter now; . . . but I have very great confidence that new applications of hydrochloric acid, admitting of being applied very extensively, at comparatively small expense, are among the things of the immediate future."

Mr. Weldon then considers the ways in which the English manufacturer of Leblanc soda may hope to recover himself and again make soda at a reasonable profit. First of all, he must get his pyrites about 50 per cent. cheaper than the price he now pays for it; the present combination between the pyrites companies will expire at the end of next year; after that time the price of pyrites must, in Mr. Weldon's opinion, fall very considerably.

Secondly, the soda-manufacturer must recover all the sulphur in his alkali waste; if he can recover the sulphur at a cost not exceeding 2*l.* per ton, he will become master of the sulphur market, as the actual cost of Sicilian sulphur delivered at Marseilles is now about 5*l.* per ton.

The third thing which the soda-manufacturer must do is to distil the coal which he now uses as fuel, condense and sell the volatile products, including tar, oils, and ammonia, and employ the residual coke as fuel; he will thus get his fuel for nothing, and at the same time will confer an inestimable boon on the towns where coal is now largely used as fuel.

These three courses, says Mr. Weldon, must be all adopted by the English soda-maker. If, in addition to doing this, the strictest economy in manufacture is practised and the purest and best product that can be made is always turned out, the manufacturer of soda by the old Leblanc method may yet hope to hold his own against the new and wonderfully successful ammonia process. M. M. P. M.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The following persons have been elected Members of the Committee for the nomination of examiners in the Natural Science Schools: Prof. R. B. Clifton; Prof. W. Odling; and Prof. H. N. Moseley. The Vice-Chancellor and Proctors complete the Committee. Up till this term the nomination of examiners lay with the Vice-Chancellor and Proctors, who appointed in turn.

The Examiners for the Burdett-Coutts Geological Scholarship have recommended Mr. F. W. Andrews, of Christ Church, for election.

Magdalen College advertises a demyship in Natural Science to be competed for in June.

CAMBRIDGE.—The following further appointments of Boards of Electors to Professorships have been made:—

Mineralogy:—Prof. Story-Maskelyne (Oxford), Dr. H. C. Sorby, Profs. Stokes, Warrington Smyth, and Liveing, Dr. Phear, Dr. Percy, and Mr. Glazebrook.

Mental Philosophy and Logic:—Prof. Croom Robertson (Univ. Coll. Lond.), J. B. Mayor (King's Coll. Lond.), and Adamson (Owens College), Messrs. H. Sidgwick, J. Ward, J. Todhunter, Shadworth H. Hodgson, and the Master of Trinity College.

Music:—Sir F. Ouseley, Messrs. Pole, T. P. Hudson, G. Grove, Sedley Taylor, G. F. Cobb, R. Pendlebury, and E. S. Thompson.

MR. ALBERT SCHAFER, F.R.S., Fullerian Professor of Physiology at the Royal Institution, has been appointed Jodrell Professor of Physiology at University College, London, in the vacancy occasioned by the resignation of Dr. J. Burdon Sanderson, LL.D., F.R.S., appointed Wayneflete Professor of Physiology in the University of Oxford.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, February 1.—Dr. Gilbert, president, in the chair.—The following were elected Foreign Members:—F. Beilstein, P. T. Cléve, H. Debray, E. Erlenmeyer, R. Fittig, H. Helmholtz, D. Mendeleeff, Victor Meyer, Lothar Meyer. The following were elected ordinary Fellows:—H. C. Bond, G. C. Basu, J. Brock, A. M. Chance, J. T. Donald, H. C. Foote, W. Fox, W. R. Flett, J. A. M. Fallon, E. C. Gill, F. Gothard, J. Hunter, H. Jones, B. R. Lee, A. H. Jackson, Joowansinghi, T. Jenner, J. E. Johnson, W. W. J. Nicol, F. W. Richardson, E. S. Spencer, C. A. Serré, T. Turner, J. E. Tuit.—The following papers were read:—On derivatives of fluorene, by W. R. E. Hodgkinson and F. E. Matthews. The fluorene was crystallised five or six times from alcohol; it melted at 113°; when pure, it does not fluoresce. A dibrom and monobrom derivative were obtained, and a fluorene sulphonic acid; by the action of caustic potash on the potassium sulphonate, a trihydroxy-diphenyl was formed; and by dropping the hydrocarbon into fused caustic potash, a dihydroxy-diphenyl was procured.—On the action of chlorine on certain metals, by R. Cowper. As observed by Wanklyn, dry chlorine has no action upon melted sodium; the author finds that dry chlorine has no action upon Dutch metal, zinc, or magnesium; it acts very slowly upon silver and bismuth; tin, arsenic, and antimony are attacked rapidly, with evolution of heat.—Some notes on hydrated ferric oxide, and its behaviour with sulphuretted hydrogen, by L. T. Wright. The author found great difficulty in obtaining ferric hydrate, by precipitating the chloride with ammonia, free from basic chloride. Having poured some ferric chloride into an excess of ammonia, he evaporated to dryness at 100°. The residue, when treated with water, gave a reddish solution which would not yield a clear filtrate, some of the

iron being probably in the so-called "colloidal" condition. Such ferric hydrate is not turned black by sulphuretted hydrogen; ordinary ferric hydrate is turned black at once, and the sulphide of iron dissolves in excess of potassium cyanide, forming potassium sulphide and ferrocyanide.—On alpha cyanonaphthalene sulphonic acid, by W. K. Dntt. The author first prepared the naphthalene sulphonic acid, then distilled the potassium salt with dry potassium ferrocyanide, and converted the cyanonaphthalene by sulphuric hydrochloride into the above substance.

The Institution of Civil Engineers.—February 13, Mr. Brunlees, president, in the chair. The paper read was on "The Design and Construction of Repairing-Slipways for Ships," by Mr. T. B. Lightfoot, M. Inst. C.E., and Mr. John Thompson.

EDINBURGH

Royal Society, January 29.—Mr. Thomas Stevenson, M.Inst.C.E., vice-president, in the chair.—Dr. Knott read a paper by Mr. H. R. Mill on the rainband, being a description of the author's observations during the last six months of 1882. The observations were all made with Mr. Hilger's smallest size of pocket spectroscope, in which the presence of the rainband is indicated only by an apparent broadening of the D line. Mr. Mill measured the varying intensities of the rainband by comparing D with the other evident lines in the spectrum—E, *b*, F. The distinctness of the fine lines in the green was also found to be an additional factor in prognosticating the weather; the less distinct these lines the greater the chance of rain. An analysis of the observations showed that of the "rain" predictions 78 per cent. came true; of the "no rain" predictions 64 per cent. —The Rev. J. L. Blake read his third communication on the theory of monopressures applied to rhythm, accent, and quantity. —Mr. John Aitken read a paper on the effect of oil on a stormy sea, in which it was proved by experiment that the presence of the oil film did not calm the waves, but merely prevented them from breaking. The reason given was that the wind had no power to produce wavelets on the oil-surface, since in virtue of the action of surface-tension any forward motion of a portion of the oil-film necessitated the forward motion of the whole. In the case of a clean water surface, again, the wind acting strongly upon any small surface portion would push it *over* the contiguous surface, and so give rise to a wavelet. Some beautiful experiments on the effect of surface-tension were shown as bearing upon the subject.—A note was read from the Astronomer-Royal for Scotland calling attention to the remarkably high temperature maximum which had occurred some time during the preceding night.

CAMBRIDGE

Philosophical Society, February 12.—The following communications were made to the Society:—On the isochromatic curves of polarised light seen in a uniaxal crystal cut at right angles to the optic axis, by Mr. R. T. Glazebrook.—On a spectrophotometer, by Mr. R. T. Glazebrook. The paper describes an arrangement for viewing simultaneously the spectra formed by the light from two different sources after traversing the same set of direct-vision prisms. These two spectra are polarised in two planes at right angles and their relative intensity is determined by the position of a Nicol in the eye-piece through which they are observed.—On a common defect of lenses, by Mr. R. T. Glazebrook. The author exhibited some lenses which, when placed between two crossed Nicol's prisms, showed strong elliptic polarisation.—On the motion of a mass of liquid under its own attraction, when the initial form is an ellipsoid, by Mr. W. M. Hicks.—On functions of more than two variables analogous to Tesseral Harmonics, by Mr. M. J. M. Hill.—Observations of the transit of Venus across the sun, taken near Kingston, Jamaica, December 6, 1882, by Dr. J. B. Pearson. In this paper the author described observations taken by himself of the late transit of Venus. He unfortunately missed seeing the first external contact, and only first saw Venus when she had intruded about one-third of her sphere on the sun's disc. On the internal contact he noticed no kind of black drop, or sympathetic attraction or assimilation between the limb of the planet and that of the sun. It seemed to him that when the planet was actually projected on the sun's disc, about 20″ before the time he assigned for actual contact, the black surface of the planet adjoining the atmosphere seemed to begin to be picked out with little white dots commencing very probably from either side. He could not say that he actually saw two horns of light gradually advancing until their points touched, but rather that the segment of the planet nearest the sun's limb, and still obscure, began to be speckled with white dots which in not more than twenty seconds, or twenty-five at the outside, developed into a white line. He saw nothing like an atmosphere around Venus, though he looked carefully for it; it was possible that his telescope, considerably smaller than what might be called the authorised size, was not large enough to show it.

BERLIN

Physiological Society, January 26.—Prof. du Bois-Reymond in the chair.—Prof. Fritsch, who, in his study of the torpedo at the zoological stations of Naples and Villafranca, has discovered, in addition to the facts already published, a series of new facts in reference to the development of this electric fish, combined these facts with those already discovered by previous investigators, and thus produced a general sketch of the development of this remarkable animal before the Society, illustrated by numerous preparations. The torpedo exhibits so many different forms in its ontological development that already de Sanctis distinguished a squaliform stage, a raiform stage, and a torpediform stage; and in fact the different stages, as the lecturer demonstrated in his series of preparations, first resemble shark-embryos, afterwards pass over into the form of rays, and finally change into that of torpedoes by the development of the electric organ. The first embryonic beginnings of the electric organ have the greatest resemblance to embryonic muscular fibres. Upon longitudinal section, there are to be seen in the interior of sheaths consisting of connective-tissue cells very distinct longitudinal fibrous striæ, with traces of transverse striation and many oval nuclei. In a later stage, on making a longitudinal section, the longitudinal fibration and transverse striæ are seen to have entirely disappeared; the nuclei have become much more numerous and circular, and in the interspaces the disc-like elements of the pillars that are to be developed are already to be seen as transverse striæ. The whole represents, in a sheath of connective-tissue, a granular mass of protoplasm with numerous nuclei. On making a transverse section, we see in the first stage, in which the organ resembles embryonic muscular-tissue, the cut ends of the longitudinal fibres as circular contours in an homogeneous connective-tissue. When the electric organ is further developed, there is seen, on making a transverse section, a polygonal net of connective-tissue, in whose meshes the round pillars lie, being separated from the walls by cellular masses. Hence Prof. Fritsch believes that the histological development of the electrical organ is analogous to the transformation of normal muscle in myomata, and that it would not be incorrect to call the electric organ a normal myoma. The phylogenetical development of the torpedo has already been described in the account of its ontogenetical development. The electric organ is developed from muscle, and indeed from the outer gill-muscles of the fifth gill-arch. The gill-arch muscle, which develops in rays and sharks into the extraordinarily powerful lower-jaw muscle, is wanting in the torpedo, and in its place we find the electrical organ, which is, comparatively speaking, a more serviceable weapon of offence and defence to the small animal than the lower-jaw muscle of the related predatory-fishes. The lecture was illustrated by a great number of microscopic and macroscopic preparations.

Physical Society, February 2.—Prof. v. Helmholtz in the chair.—Dr. Hertz described a series of peculiar light-phenomena which he had observed in the case of electric discharges. When, in a moderately rarefied space (pressure about 20 to 30 mm. of mercury), the electric discharge takes place between electrodes, one of which is fixed in a tube that is closed at one end and drawn out to a small opening at the other end, while the second electrode is placed laterally near the opening of the tube, the spark of discharge springs from the opening, laterally, to the second electrode; at the same time, however, one sees a ray of yellow-brown light break forth from the tube, reaching out a few centimetres in the prolongation of it. With stronger or with weaker pressure, the ray is shorter and less luminous; and if a Leyden jar be inserted, the ray is also shorter, but it is more luminous. The form of this ray (which broadens at the end) is very varied; and if it impinges on the wall of the vessel inclosing the rarefied space, it produces whirling there. The colour of the ray is different according to the gas: yellow with air and oxygen, blue with hydrogen, &c., and spectrum analysis shows that it is the respective gases that glow. If a small

mica-disc be introduced into the luminous ray, it enters into oscillation; and a small mill is set in rotation by the ray. This proves that real material particles, glowing masses of gas, are driven forth in the discharge from the tube. The wall on which the ray impinges is strongly warmed, and a thermometer put into the ray rises 10° to 20°. If the ray, which to the naked eye seems quite continuous, be looked at through a slit in a rotating disc, so arranged that the slit, in different, very short intervals of time after each opening of the primary current of the induction-coil, passes before the eye, one sees in the first moment a small ray at the opening, then, at a later moment, a small cloud above the opening, and finally a larger luminous cloud floating at a greater distance from the opening. The light-ray is thus discontinuous; and at each spark-discharge separate clouds of glowing gases are driven out from the tube, which are ever enlarging. Even at atmospheric pressure these light-phenomena may, with careful observation, be perceived. They occur mostly in the air as yellow sheaths about the aureoles of the sparks, and with different electrodes present manifold forms: sheaths, swellings, whirls, and the like. In moist air the phenomenon is quite absent, and in hydrogen it soon ceases. The great variety of the appearances have not yet been brought under one common standpoint.—Dr. Goldstein had observed similar phenomena to those just described by Dr. Hertz, and made a number of experiments regarding them. In spectral tubes he saw the yellow light appear at the places of passage from the thin to the wider parts, in cylindrical tubes, on the other hand, the yellow light always surrounded the red discharge-light as an envelope, which in the neighbourhood of the cathode gradually widened, and from there progressively filled the tube. If evacuation be effected during the discharge, one sees that the yellow light, with the air, is driven out of the tube. This glowing of the gas Dr. Goldstein connects with the long-known after-luminosity of Geissler tubes, which he has sometimes found to last many seconds, and even some minutes, after discharge. The essential thing in the case of phosphorescent Geissler tubes is the change between wider and narrower parts, because only at the places of transition does the after-luminosity develop that light—yellow in air, blue in hydrogen, and other colours in other gases.

PARIS

Academy of Sciences, February 12.—M. Blanchard in the chair.—The following papers were read:—On the difference of barometric pressures at two points of a given vertical, by M. Jamin. He shows from records of the double observatory at the base and at the top of the Puy de Dôme, for 1880, that the difference of pressures varies very regularly every day and throughout the year, diminishing till 3 p.m., then increasing till sunrise, also increasing from the summer to the winter solstice. Kaemitz, in 1832, proved such variation with the season in Switzerland. Similar effects, due to temperature, doubtless occur everywhere. We have to conceive an atmospheric enlargement, a kind of air-tide, moving round with the sun. The resulting phenomena are complex. M. Jamin shows how the variations of the difference of pressures in a given vertical, with changes of temperature, pressure, and hygrometric state, may be calculated.—Researches on chromates, by M. Berthelot.—On the groupings of the animal world in primary times (second note), by M. Gaudry. Each of the epochs seems to have had special expansions, beings that began with it and ended with it. The irregularities met with do not favour the idea of a struggle for life in which the victory was to the strongest and best-endowed. There are many striking personalities, *rois de passage* (so to speak), giving the epochs a character of their own, so that as we speak of the age of Charlemagne, &c., we may say the age of *Paradoxides*, of *Pterichthys*, &c. But it is often the most specialised and perfect beings that have disappeared. Other types, representing the just mean, have persisted.—On the numbers of unequal ordinary fractions which may be expressed by using figures which do not exceed a given number, by Mr. Sylvester.—Refutation of a second critique by M. Zeuner, &c. (continued), by M. Hirn.—Researches on the *rôle* of inhibition in a special kind of sudden death, and with regard to the loss of consciousness in epilepsy, by M. Brown-Séquard. The losses of function and activity of the brain, in certain cases, are pure effects of inhibition, arising from irritation more or less distant.—Influence of subterranean humidity and of capillarity of the soil on the vegetation of vines, by M. Barral. The fruitfulness of the vine on the sandy soil of Aigues-Mortes is due to abundant water in the subsoil (from 1 m. depth) rising to the roots by capillarity. The author describes several laboratory experiments.—On treatment of the vine with sulphur in Greece, by M. Gennadius. This treatment (for oïdium) is thought successful only if carried out on a day without wind, rain, or clouds, and with a burning sun. This fine weather must last twenty-four hours. It is the sulphurous vapour, and not the sulphur powder, that kills the spores in the air and on the vine, though the powder may act mechanically (and other fine powders will do the same) by protecting tender parts from contact with spores.—On germinated wheat, by M. Ballard. The gluten is profoundly altered; there is more acidity and more sugar and lignin; less fatty matter.—On the relations that exist between covariants and invariants of binary forms, by M. Perrin.—On the theory and experiments of MM. Mercadier and Vaschy tending to establish the non-influence of the di-electric on electro-dynamic actions, by M. Lévy.—General method for strengthening telephonic currents, by Mr. Moser. He introduces more induced coils.—On chlorides of lead and of ammonia, and oxychlorides of lead, by M. André.—Preparation of ethers of trichloracetic acid, by M. Clermont.—Contribution to the study of isomerism in the pyridic series, by M. Œchsner de Coninck.—On the relative toxical power of metallic salts, by Mr. Blake. His tabulated data of experiments show why he cannot accept the law formulated by M. Rabuteau (that metals are more active the greater their atomic weight and the smaller their specific heat).—Penetration of actinic radiations into the eye of man and of vertebrate animals, by M. de Chardonnet. He finds that no medium of the eye is transparent for the ultra-solar radiations, that is, for waves shorter than T or U, the limits of the ultra-violet solar spectrum. The mitilating membrane in sparrow-hawks and fowls is translucid for part of the ultra-violet spectrum (up to O and Q). The absorbing power of the vitreous humour, cornea, and crystalline lens varies in different species. The general fluorescence corresponds to actinic absorption, but there are exceptions.—New researches on the production of monsters in the hen's egg by the effect of late incubation, by M. Dareste. This takes place more slowly in winter than in summer. Also eggs of the same age grow old more or less quickly.—On the tonic and inhibitory *rôle* of the sympathetic ganglions, and their relation to vaso-motor nerves, by MM. Dastre and Morat.—The mode of fixation of the suckers of the leech studied by the graphic method, by M. Carlet. The movements of the animal on smoked paper were observed. It has been received that the oval sucker is attached first by the centre, then by the borders, but the author finds that the borders are fixed first. Detachment, too (which does not seem to have attracted attention), begins at the borders.—On a new fixed Crinoid, *Democrinus parfaiti*, obtained in dredging from the *Travailleur*, by M. Perrier. This makes only the fifteenth species known. It is distinguished by a long funnel-like cup, formed of five basal pieces.—Geological and chemical researches on the saliferous formations of the Swiss Alps, and especially on that of Bex, by M. Dieulafait. These beds the author regards as products of evaporation of ancient seas.

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